UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
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Seattle, WA 98115

January 12, 2001

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Mark G. Miller
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Fish and Wildlife Service
P.O. Box 848
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Re: Biological Opinion for Chumstick Creek Culvert Replacements (NMFS No. WSB-00-209 and WSB-00-393)

Dear Ms. Smith and Mr. Miller:

The attached document transmits the National Marine Fisheries Service's (NMFS) Biological Opinion (BO) on the proposed Chumstick Creek Culvert projects in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq*.). The Bonneville Power Administration (BPA) and U.S. Fish and Wildlife Service (FWS) determined that the proposed actions are likely to adversely affect endangered fish that occur under NMFS' jurisdiction: Upper Columbia River steelhead (*Oncorhynchus mykiss*) and Upper Columbia River spring-run chinook (*O. tshawytscha*) Evolutionarily Significant Units (ESUs). Formal consultation was initiated for this project on September 18, 2000.

This BO reflects formal consultation and an analysis of effects covering the Upper Columbia River steelhead and Upper Columbia River spring-run chinook in Chumstick Creek, Washington. The BO is based on information provided in the Biological Assessments (BAs) sent to NMFS by the BPA and FWS on August 17, and April 19, 2000, respectively, and additional information transmitted via telephone conversations and e-mail. A complete administrative record of this consultation is on file at the Washington State Habitat Branch Office.

The NMFS concludes that implementation of the proposed projects is not likely to jeopardize the continued existence of Upper Columbia River steelhead or Upper Columbia River spring-run chinook or result in destruction or adverse modification of their critical habitat. In your review, please note that the incidental take statement, which includes reasonable and prudent measures and terms and conditions, was designed to minimize take.

If you have any questions, please contact Joe Miller of the Washington State Habitat Branch Office at (360) 534-9309.

Sincerely,

for

Donna Darm
Acting Regional Administrator

Enclosure

ENDANGERED SPECIES ACT-SECTION 7

BIOLOGICAL OPINION

Chumstick Creek Culvert Replacements
WSB-00-209
WSB-00-393

Agencies: U.S. Fish and Wildlife Service and Bonneville Power Administration

Consultation
Conducted By: National Marine Fisheries Service
Northwest Region
Washington State Habitat Branch

Approved _____ Date January 12, 2001
Donna Darm
Acting Regional Administrator

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I. BACKGROUND AND DESCRIPTION OF THE PROPOSED PROJECT

A. Background

This biological opinion (BO) is the product of combined section 7 consultations on two Biological Assessments (BAs) submitted by (1) the United States Fish and Wildlife Service (FWS), and (2) the Bonneville Power Administration (BPA). They will be referred to hereafter as the "FWS" and "BPA" projects.

Both BAs are for proposed culvert replacement projects on Chumstick Creek in Chelan County, Washington. These projects are being considered together based on the similarity of proposed construction activities, similar impacts to listed species and critical habitat, as well as the close proximity of the projects to one another. Formal consultation was initiated for both projects on September 18, 2000.

Both projects have a Federal nexus through funding by BPA, but the lead project proponents are FWS and Natural Resources Conservation Service (NRCS) (FWS project); and the Chelan County Department of Public Works (CCDPW) and the Washington State Department of Fish and Wildlife (WDFW) (BPA project).

This BO reflects the results of the formal consultation process. Formal consultation involves reviewing information contained in BAs, correspondence and communication between NMFS and the action agencies, and visiting the project site (August 11, 2000).

The objective of this BO is to determine whether the proposed projects are likely to jeopardize the continued existence of Upper Columbia River (UCR) steelhead and Upper Columbia River spring-run (UCRS) chinook salmon evolutionarily significant units (ESUs), or result in the destruction or adverse modification of their designated critical habitat.

B. Description of the Proposed Action

The proposed FWS and BPA projects will replace a total of 24 round culverts along Chumstick Creek, near Leavenworth, Washington. The purpose of this action is to improve anadromous fish passage through Chumstick Creek and, consequently, open 75 mi^2 of upstream habitat that is currently unavailable due to barriers presented by perched, misaligned, and undersized culverts.

1. FWS Project

The FWS project will replace 23 undersized and misaligned culverts along the lower five miles of Chumstick Creek with new bottomless-arch culverts. In this region, Chumstick Creek flows parallel to Highway 209 and is crossed by a series of residential driveways. The 23 existing culverts run through the subgrade material below the individual driveways.

The culvert replacement process will require a number of specific activities: (1) nearshore and instream excavation; (2) removal of existing culverts; (3) installation of new bottomless-arch culverts; (4) backfilling; and (5) Best Management Practices (BMPs) designed to minimize impacts to salmonids and their critical habitat (see Terms and Conditions). Heavy equipment, power tools and a hand crew will be used for the construction activities. For each culvert replaced, up to 130 yd^3 of soil will be disturbed (through excavating and backfilling). The new culverts will be sized to allow bankfull-width flow (typical size: rise= 6.6 ft; span= 12 ft; length= 22.5 ft). This project is planned for summer 2001 and the specific work windows will be determined in the WDFW Hydraulic Project Approval (HPA).

The general sequence and content of construction activities is outlined below:

- install silt fences, straw bales and other erosion/sedimentation control devices;
- excavate around existing culverts and embankment;
- remove, dismantle, and dispose of existing culvert;
- restore and roughen creek-bed inside and adjacent to culvert with select materials specified in Hydraulic Permit Approval (HPA);
- backfill around culvert and restore driveway;
- replant exposed soils and disturbed riparian areas

2. BPA Project

The BPA project focuses on removal and replacement of a single round, metal culvert (diameter= 10 ft; length= 178 ft) located immediately downstream of the FWS project. This existing culvert runs under North Road, approximately three-quarters of a mile upstream from the confluence of Chumstick Creek and the Wenatchee River. The culvert was installed in 1957, and has acted as a partial barrier to passage since that time. The new culvert is expected to greatly improve fish passage as it will be wider and shorter than the old one (diameter= 22 ft; length= 68 ft), and it will be countersunk (40% of its diameter).

Removal and replacement of the North Road culvert will include six major elements: (1) stream diversion; (2) culvert removal; (3) culvert installation; (4) repaving North Road; (5) creek channel restoration; and (6) installation of downstream grade controls (rock sills). In addition, BMPs designed to minimize impacts to salmonids and their critical habitat will be implemented (See Terms and Conditions). Construction activities will require work crews and heavy equipment (e.g., excavator, dump truck, bulldozer, backhoe and concrete pump truck). This project is planned for summer 2001, but specific work windows will be determined in the WDFW HPA. The general sequence and content of construction activities is outlined below:

- install silt fences, straw bales and other erosion/sedimentation control devices;
- temporarily divert stream around existing culvert (with a pipe);
- excavate around existing culvert and embankment;
- remove, dismantle, and dispose of existing culvert;
- place and countersink new culvert;

- de-water headwall footings using a pump;
- construct headwalls on both ends of new culvert (each will require 17 yd^3 of cement);
- restore creek-bed inside and adjacent to (above and below) culvert with select materials specified in the HPA;
- place 5 grade control structures (rock sills) in and around the new culvert;
- backfill around culvert and repave North Road;
- replant exposed soils and disturbed riparian areas

3. Action Area

For the purposes of this BO, the action area for the FWS and BPA projects will include the entire Chumstick Creek drainage, its tributaries and critical habitat upstream to the farthest extent of anadromous migration, and the downstream reach of Chumstick Creek extending to the Wenatchee River.

II. STATUS OF THE SPECIES AND CRITICAL HABITAT

The listing status, biological information, and critical habitat elements or potential critical habitat for the indicated species are described in Table 1.

Species	**Listing Status Reference**	**Critical Habitat Reference**	**Biological Information**
Upper Columbia River steelhead (*Oncorhynchus mykiss*)	Endangered Species, August 18, 1997 (62 Fed. Reg. 43937)	Designated Critical Habitat, February 16, 2000 (65 Fed. Reg. 7764)	Status Review of West Coast Steelhead from Washington, Idaho, Oregon and California, (Busby *et al.*, 1996)
Upper Columbia River spring-run chinook (*O. tshawytscha*)	Endangered Species, March 24, 1999 (64 Fed. Reg. 14308)	Designated Critical Habitat, February 16, 2000 (65 Fed. Reg. 7764)	Status Review of Chinook Salmon from Washington, Idaho, Oregon and California, (Myers *et al.*, 1998)

Table 1. References to Federal Register Notices and Status Reviews containing additional information concerning listing status, biological information, and critical habitat designations for listed species considered in this BO.

The proposed actions would occur within the designated critical habitat of both UCR steelhead and UCRS chinook. Essential features of this critical habitat include substrate, water quality/quantity, water temperature, water velocity, cover/shelter, food, riparian vegetation, space, and safe passage conditions (65 Fed. Reg.7764, February 16, 2000).

Upper Columbia River steelhead and UCRS chinook have both been negatively affected by a similar combination of habitat alterations and management practices. The primary habitat alteration has been hydrosystem development along the Columbia River. Chief Joseph and Grand Coulee Dams have blocked access to important spawning and rearing habitat, and the lower Columbia River mainstem dams act as partial barriers to passage for adults and juveniles. Other habitat degradation has occurred through irrigation diversions, urbanization and livestock grazing. Hatchery management practices have also encouraged the genetic homogenization of stocks and loss of important locally adapted traits throughout both UCR steelhead and UCRS chinook ESUs. A complete discussion of the important factors in the decline of UCRS chinook and UCR steelhead can be found in Busby *et al.* (1996); Myers *et al.* (1996); NMFS (1996); and 63 Fed. Reg. 11482 (March 9, 1998).

The natural production levels of both UCR steelhead and UCRS chinook are very low. For UCR steelhead, production has remained relatively constant in the major rivers of the ESU (Wenatchee, Methow, and Okanogan). Five year natural escapment levels (1989-93) averaged 800 steelhead in the Wenatchee River and 450 steelhead in the Methow and Okanogan rivers combined. Natural production consistently falls below the 1:1 replacement level; up to 80% of total production is from hatcheries. Based on analyses of population size and production levels UCR steelhead are not capable of maintaining self-sustaining populations at this time (62 Fed. Reg. 43937, August 18, 1997).

Similar to UCR steelhead, UCRS chinook have exhibited a decreasing trend in abundance and productivity. The average recent escapement to the ESU has been less than 5,000 hatchery and wild chinook combined; all individual populations consist of less than 100 fish. Additionally, the genetic integrity of most remnant natural populations has been altered by hybridization with hatchery stocks. To date, there are at least six known spring chinook extinctions in this ESU (64 Fed. Reg. 14308, March 24, 1999).

III. EVALUATING PROPOSED ACTIONS

The standards for determining jeopardy are set forth in section 7(a)(2) of the ESA as defined by 50 C.F.R. Part 402 (the consulting regulations). The NMFS must determine whether the action is likely to jeopardize the listed species and/or whether the action is likely to adversely modify critical habitat. This analysis involves the initial steps of (1) defining the biological requirements and current status of the listed species, and (2) evaluating the relevance of the environmental baseline to the species' current status.

Subsequently, the NMFS evaluates whether the action is likely to jeopardize the listed species by determining if the species can be expected to survive with an adequate potential for recovery. In making the determination, NMFS must consider the estimated level of mortality attributable to (1) collective effects of the proposed or continuing action, (2) the environmental baseline, and (3) any cumulative effects. This evaluation must take into account measures for survival and recovery specific to the listed salmon's life history stages that may occur beyond the action area. If NMFS finds that the action is likely to jeopardize, NMFS must identify reasonable and prudent alternatives for the action.

Furthermore, NMFS evaluates whether the action, directly or indirectly, is likely to destroy or adversely modify the listed species' designated critical habitat. The NMFS must determine whether habitat modifications appreciably diminish the value of critical habitat for both the survival and recovery of the listed species. The NMFS identifies those effects of the action that impair the function of any essential element of critical habitat. The NMFS then considers whether such impairment appreciably diminishes the habitat's value for the species' survival and recovery. If NMFS concludes that the action will adversely modify critical habitat, it must identify any reasonable and prudent measures available.

Guidance for making determinations of jeopardy and adverse modification of habitat are contained in NMFS' document: *The Habitat Approach, Implementation of Section 7 of the Endangered Species Act for Actions Affecting the Habitat of Pacific Anadromous Salmonids*, August 1999.

For the proposed action, NMFS' jeopardy analysis considers direct or indirect mortality of fish attributable to the action. The NMFS' critical habitat analysis considers the extent to which the proposed action impairs the function of essential elements necessary for migration and spawning of the listed salmon under the existing environmental baseline.

A. Biological Requirements

The first step in the methods NMFS uses for applying the ESA section 7(a)(2) to listed salmon is to define the species' biological requirements that are most relevant to each consultation. The NMFS also considers the current status of the listed species; taking into account population size, trends, distribution and genetic diversity. To assess the current status of the listed species, NMFS starts with the determinations made in its original decision to list the species (i.e., UCR steelhead and UCRS chinook) for protection under the ESA. Additionally, the assessment will consider any new information or data that are relevant to the determination (see Table 1 for references).

The relevant biological requirements are those necessary for the listed species to survive and recover to naturally reproducing population levels at which time, protection under the ESA would be unnecessary. Species or ESUs not requiring ESA protection have the following attributes: population sizes large enough to maintain genetic diversity and heterogeneity, the ability to adapt to and survive environmental variation, and are self-sustaining in the natural environment

Both UCR steelhead and UCRS chinook have similar basic biological requirements. These requirements include food; flowing water (quantity); high quality water (cool, free of pollutants, high dissolved oxygen concentrations, low sediment content); clean spawning substrate; and unimpeded migratory access to and from spawning and rearing areas (adapted from: Spence *et al.* 1996).

The NMFS has related the biological requirements for listed salmonids to a number of habitat attributes, or pathways, in the Matrix of Pathways and Indicators (MPI). These pathways (water quality, habitat access, habitat elements, channel condition and dynamics, flow/hydrology, watershed conditions, disturbance history, and riparian reserves) indirectly measure the baseline biological health

of listed salmon populations through the health of their habitat. Specifically, each pathway is made up of a series of individual indicators (e.g., indicators for water quality include temperature, sediment, and chemical contamination.) that are measured or described directly (see NMFS 1996). Based on the measurement or description, each indicator is classified within a category of the properly functioning condition (PFC) framework: (1) properly functioning, (2) at risk, or (3) not properly functioning. Properly functioning condition is defined as "the sustained presence of natural habitat forming processes in a watershed that are necessary for the long-term survival of the species through the full range of environmental variation."

B. Factors Affecting the Species within the Action Area

Section 4(a)(1) of the ESA and NMFS listing regulations (50 C.F.R § 424) set forth procedures for listing species. The Secretary of Commerce must determine, through the regulatory process, if a species is endangered or threatened based upon any one or a combination of the following factors; (1) the present or threatened destruction, modification, or curtailment of it habitat or range; (2) overutilization for commercial, recreational, scientific, or educational purposes; (3) disease or predation; (4) inadequacy of existing regulatory mechanisms; or (5) other natural or human-made factors affecting its continued existence.

The proposed action includes activities that would have some level of effects with short-term impacts from the first category and the potential for long-term impacts from the fifth category. The characterization of these effects and a conclusion relating the effects to the continued existence of UCR steelhead and UCRS chinook is provided below, in section IV.

The major factors affecting steelhead and chinook within the action area include: barriers to passage, poor water quality, lack of riparian habitat, and alterations of the natural channel morphology. To analyze and describe the effects of these factors on listed species, NMFS uses the MPI. As described above, the MPI relates the biological requirements of listed species to a suite of habitat variables. In the MPI analysis presented here, each factor is considered in terms of its effect on relevant pathways and associated indicators (properly functioning, at risk, or not properly functioning).

1. Barriers to Passage

Currently, Chumstick Creek is not accessible to most salmonids due to barriers present in the lower reaches. At least 23 culverts act as act as barriers during all flows, and nine culverts are considered to be low flow barriers (USFWS 2000). Additionally, Chumstick Creek was identified in the 1992 Washington Salmon and Steelhead Stock Inventory (SASSI), and listed on Washington State's 303(d) list, for having low flow conditions (WDF *et al.* 1992). Because of barriers and low flow conditions, the Chumstick Creek habitat access indicator is considered to be not properly functioning.

2. Water Quality

Chumstick Creek has relatively poor water quality due to agricultural pollution, lack of riparian buffers,

road building, and urbanization. Chumstick Creek is listed on Washington State's 303(d) List, under the Clean Water Act (CWA), for not meeting temperature, dissolved oxygen, pH, fecal coliform, and instream flow standards. Consequently, water quality habitat indicators are either at risk or not properly functioning.

3. Lack of Riparian Habitat

The riparian reserves in Chumstick Creek are reduced in size, continuity, composition, and successional stages. Overall, the lower creek corridor lacks significant woody vegetation and is dominated by reed canary grass. As a result, the riparian reserve indicator is not properly functioning, and the potential for normal riparian processes (e.g. shading, bank stabilization and large woody debris (LWD) recruitment) to occur is diminished. For salmonids, this translates into water temperatures that are higher than optimal, lack of cover, and erosion/sedimentation that may reduce the suitability of certain substratum for spawning (Mitchell and Lobos 1996; Titus 1997; Bugert *et al*. 1998; USFWS 2000).

4. Altered Channel Morphology

The Chumstick Creek channel has been negatively altered by adjacent land use. Highway 209 and railroad tracks run parallel to the creek, narrowing and straightening its channel and preventing contact with the historic floodplain. Additionally, the presence of numerous culverts and lack of LWD, prevents the existence of normal hydrogeomorphic processes (e.g., pool formation) which create habitat heterogeneity beneficial to salmonids. As a result, habitat indicators such as pool quality, pool frequency, off-channel habitat, and flood plain connectivity are all not properly functioning (Titus 1997; Bugert *et al*. 1998; USFWS 2000).

C. Environmental Baseline

The environmental baseline represents the current basal set of conditions to which the effects of the proposed action would be added. The term "environmental baseline" means "the past and present impacts of all Federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process " (50 C.F.R.§ 402.02). As described above, the action area for this consultation will include the entire Chumstick Creek drainage, its tributaries and critical habitat upstream to the farthest extent of anadromous migration, and the downstream reach of Chumstick Creek extending to the Wenatchee River.

Chumstick Creek is a third order stream draining a subbasin of 49,920 acres in the Wenatchee River Basin. Approximately 36,480 acres of the watershed is managed and owned by the Wenatchee National Forest and 13,440 acres are privately or state owned. The private and state owned lands, which are found throughout the floodplain, have been developed for residential, pasture, and agricultural use. As a consequence of this development, Chumstick Creek has been identified as the second most significant contributor to the degraded water quality in the Wenatchee River Basin (CCCD 1994).

Because salmonids require clean cool water with high levels of dissolved oxygen (Spence 1996), poor water quality effectively degrades the potential of a waterbody to support salmonids, especially vulnerable life history stages (juveniles).

Chumstick Creek has had its channel modified and flood plain connectivity reduced by the construction and existence of adjacent transportation infrastructure. In 1957, a large culvert was placed over Chumstick Creek to pass flows beneath the North Road. Since its construction, the North Road culvert has greatly reduced the passage of fish to higher reaches of Chumstick Creek. Private driveways crossing the creek just above the North Road are another source of instream barriers. Also, Highway 209 and the Burlington Northern Railroad track run parallel to Chumstick Creek, creating an unnatural creek alignment and preventing interactions with the floodplain. These types of modifications (culverts, channel alignments and flood plain separation) reduce the functional value of existing habitat through precluding the connection and existence of important rearing and adult salmonid habitat features (e.g., natural substrate, side channels, wetland connections, velocity refuges, and links to allochthonous material sources).

Vegetation in the Chumstick subbasin varies by altitude and proximity to the creek. Shrub steppe and ponderosa pine dominate the lower elevations while Douglas fir and grand fir occur at higher elevations. Due to logging and land use practices, most of the larger trees have been removed, and the forest consists mainly of thick stands of smaller trees. Vegetation in the riparian zone consists mainly of cottonwood, red osier dogwood, willow, alder, wild rose, snowberry, hawthorn and reed canary grass. In areas where disturbances have occurred (i.e., culvert locations, pasture land and driveways) reed canary grass dominates. The degradation of the riparian zone, in terms of logging, urbanization and the subsequent establishment of disturbance oriented vegetation communities (i.e., reed canary grass), diminishes the value of existing habitat primarily by (1) decreasing shade levels (raises instream temperatures), and (2) increasing runoff from adjacent land, which causes turbidity and sedimentation. As noted in the FWS BA, temperature and sediment are both high in Chumstick Creek, and considered to be at risk and not properly functioning, respectively. Using the high levels of fines present in the Chumstick substrate as a surrogate measure for turbidty, it is also probable that turbidity levels are high and either at risk or not properly functioning.

IV. ANALYSIS OF EFFECTS

A. Effects of the Proposed Action

The NMFS' ESA implementing regulations define "effects of the action" as "the direct and indirect effects of an action on the species or critical habitat together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline." Direct effects are immediate effects of the project on the species or its habitat, and indirect effects are those that are caused by the proposed action and are later in time, but are still reasonably certain to occur (50 C.F.R.§ 402.02).

1. Direct Effects

Direct effects result from the agency action and include the effects of interrelated and interdependent actions. Future Federal actions that are not direct effects of the action under considerations (and not included in the environmental baseline or treated as indirect effects) are not evaluated. The direct effects of the proposed culvert replacements include a temporary increase in turbidity, disturbance of the creek-bed, and the beneficial effect of improved fish passage.

Turbidity and Sedimentation--Instream excavation, placement of rock sills (BPA project only), and the installation of culverts will cause existing sediments to be mobilized and, consequently, temporarily increase downstream turbidity levels (measured in terms of nephelometric turbidity units (NTUs)) and sedimentation rates. In the immediate vicinity of the construction activities (several meters), the level of turbidity would likely exceed the natural background levels by a significant margin and potentially affect fish.

Quantifying turbidity levels, and their impact to fish species, is complicated by several factors. First, turbidity from an instream activity will typically decrease as distance from the activity increases. How quickly turbidity levels attenuate is dependent upon the quantity of materials in suspension (e.g. mass or volume), the particle size of suspended sediments, the amount and velocity of ambient water (dilution factor), and the physical/chemical properties of the sediments. Second, the impact of turbidity on fishes is not only related to the turbidity levels (NTUs), but also the particle size of the suspended sediments.

For salmonids, turbidity has been linked to a number of behavioral and physiological responses (i.e., gill flaring, coughing, avoidance, increase in blood sugar levels) which indicate some level of stress (Bisson and Bilby 1982; Sigler *et al*. 1984; Berg and Northcote 1985; Servizi and Martens 1992). The magnitude of these stress responses is generally higher when turbidity is increased and particle size decreased (Bisson and Bilby 1982; Servizi and Martens 1987; Gregory and Northcote 1993). Although turbidity may cause stress, Gregory and Northcote (1993) have shown that moderate levels of turbidity (35-150 NTU) accelerate foraging rates among juvenile chinook salmon, likely because of reduced vulnerability to predators (camouflaging effect).

When the particles causing turbidity settle out of the water column, they contribute to sediment on the stream-bed (sedimentation). If a large amount of sedimentation occurs, several important, deleterious effects may occur: (1) buried salmonid eggs may be smothered and suffocated, (2) cobbles and gravels may be covered, reducing available habitat to potential prey items such as larval invertebrates (see Disturbance of Creek Bed section below), and (3) displacement of future spawning habitat (Spence *et al.* 1996)

The FWS and BPA projects will cause elevated turbidity levels during the instream construction period (60 days), and for several days afterwards. The effects of this turbidity on listed fish will be minimized by implementing a temporary erosion and sediment control plan (TESC), and also to some extent by the fact that salmonids are currently excluded from the majority of the action area by the culverts (which are to be replaced). Because steelhead and chinook are mobile, and Chumstick Creek is not a closed

system (e.g., a pond), it is expected that listed fish present during construction will temporarily move to refuges where high turbidity can be avoided, thus preventing injury or death. Because the turbidity caused by this action will be short lived, returning to baseline levels soon after construction is over, long term impacts (i.e., adverse modification of critical habitat) will not occur. Other than the short term inputs mentioned above, this project will not change or add to the existing baseline turbidity or sedimentation levels within Chumstick Creek.

Disturbance of Creekbed--The FWS and BPA projects will disturb the substrate of the Chumstick Creek creekbed. The primary mechanisms of disturbance include excavation, removing existing culverts, dewatering substrate, placing rock sills, and back-filling. The direct effect on steelhead and chinook is expected to be minor. Because the new culverts will be placed in the footprints of existing culverts, it is unlikely that any spawning habitat will be disturbed. The most significant impact will be the temporary loss (burial, dessication, and displacement) of some potential prey species (invertebrates) and their habitat. Lost foraging opportunities resulting from this disruption would be short-lived as new invertebrates would recolonize the disturbed substrate (Allan 1995). It also important to note that the new culverts will not have bottoms or will be substantially shorter in length than existing ones, thereby improving creek-bed conditions by exposing the natural substrate.

Invertebrates (e.g., larval insects, obligate aquatic insects, molluscs, crustaceans etc.) recolonize disturbed areas by drifting, crawling, swimming, or flying in from adjacent areas (Mackay 1992). The time required for new invertebrates to reach pre-disturbance abundance levels and equilibrium would be related to the spatial scale of their initial habitat loss, the persistence of the excluding or disturbing mechanism, the size of adjacent or remnant invertebrate populations (potential colonizers), the season in which the disturbance is taking place, and the life history characteristics of the invertebrate species (Mackay 1992). In the case of Chumstick creek, recolonization rates are expected to be rapid due to (1) the small size of the disturbance, (2) the short time period of construction activities, and (3) the summer work window which coincides, at least generally, with high levels of invertebrate activity (and therefore recolonization potential). Even in the period when prey abundance is temporarily reduced, the impact to listed fish will be minimal as both juvenile chinook and steelhead are rare in the action area and not likely to be food limited. Thus, the culvert replacements will not reduce the long-term functional quality of juvenile foraging habitat in Chumstick creek, and may improve baseline conditions by improving the quality of substrate (prey habitat) in the vicinity of the new bottomless culverts.

Improved Fish Passage--The installation of new culverts will improve salmonid passage conditions throughout the action area. Improved passage conditions will increase the available upstream foraging and rearing habitat for juvenile salmonids and may provide additional spawning habitat for adults.

The existing Chumstick Creek culverts are perched, misaligned, undersized, and, consequently, prevent passage. The new culverts will be larger and have a bottomless arch design (except for the BPA culvert which will have an increased diameter and length but will not be bottomless). Larger diameter, shorter-length culverts, and especially bottomless arch culverts, are desirable for fish passage purposes (BPA 1985).

2. Indirect Effects

Indirect effects are caused by or result form the proposed action, are later in time, and are reasonably certain to occur (50 C.F.R. § 402.02). Indirect effects can occur outside of the area directly affected by the action. Indirect effects can include other Federal actions that have not undergone section 7 consultation but will result from the action under consideration. These actions must be reasonably certain to occur, or they are a logical extension of the proposed action.

The indirect or longer term effects of the proposed culvert replacements are expected to be beneficial for listed fishes. These effects include improved passage of debris (fewer blocked culverts), alteration of channel morphology, and potential establishment of locally adapted steelhead and chinook populations.

Passage of Debris--Properly sized/designed culverts (*see* BPA 1985) will improve the passage of debris at low and high flows. Undersized culverts inhibit the passage of floating debris and increase the probability of a debris jam occurring. A debris jam at the mouth of a culvert may make passage for juvenile and adult salmonids difficult (BPA 1985). When coupled with high flows, a blocked or undersized culvert may "blow out", destroying downstream habitat in a concentrated torrent of water and debris. Replacing blown out culverts requires in-water work and may create additional risks of adversely affecting listed species through degradation of the water quality and other habitat indicators.

Allowing debris (including plant material and substrate) to pass through culverts also encourages LWD recruitment and natural fluvial deposition at downstream locations (restoration of LWD and substrate indicators). These processes create rearing and spawning habitat that is essential to salmonids. As noted earlier, Chumstick Creek has low concentrations of LWD, so it is important to distribute the LWD that does exist to locations where listed fish will benefit (not at the mouths of culverts).

Alteration of Channel Morphology--The construction of the five rock sills (BPA project) will have several minor impacts on the existing channel morphology of Chumstick Creek. First, the rock sills will incorporate vertical heterogeneity into the horizontal profile of the creek. The sills will act as steps, creating an elevation cline between the water surface upstream and downstream of them. These steps are expected to be very small, though, as the individual sills will largely be buried in sediments (keyed into the creek-bed). As a result they will not impede fish passage, but they will recruit natural sediments to the culvert and adjacent to it. Additionally, the rock sills will maintain pool conditions at the outfall of the new culvert.

The FWS bottomless arch culverts will also enhance substrate conditions and channel dynamics for UCRS chinook and UCR steelhead. Normal round culverts prevent recruitment and persistence of natural creek-bed substrate and also prevent local hyporheic connectivity. Natural creek-beds and hyporheic connectivity are important for invertebrate production and providing cover for juvenile salmonids.

The overall effect of the altered channel morphology will be a minor benefit to listed UCR steelhead and

UCRS chinook. Increasing the vertical heterogeneity of the channel, recruiting natural substrate, and reconnecting with hyporheic water sources will be an improvement over the existing baseline conditions. As described earlier, this reach of Chumstick Creek is lacking in pool quantity and quality. The proposed rock sills will increase the functional value of the reach by adding some diversity (a vertical component) to the otherwise homogenous channel. Although these improvements to baseline conditions may be relatively small, cumulatively they will contribute to the attainment of properly functioning condition within the watershed

Local Adaptation--When culverts are improved or removed to the extent that they no longer serve as barriers to passage, the immediate benefit is likely to be an increase in numbers of fish traveling above the previous barrier. However, the long-term benefit of improved habitat access is more difficult to quantify but equally or more important than the increase numbers alone. This long-term benefit is expressed in terms of genetic diversity and locally adapted populations arising from habitat expansion and increased habitat diversity.

When sufficient freshwater habitat diversity exists, single species of salmonids may exhibit wide variation in life history and morphometric traits (e.g., Blair *et al*. 1993). These traits are often unique to a specific geographic location and are referred to as "locally adapted." Locally adapted subpopulations maintain reserves of genetic information that allow salmonids to recolonize disturbed areas and deal with environmental changes (Milner and Baily 1989). The loss of locally adapted populations through habitat degradation may significantly reduce a species ability to respond to extinction mechanisms (Waples 1991). Conversely, when habitat is made available, its presence fosters the development and maintenance of locally adapted subpopulations, and may reduce the likelihood of extinction for endangered species.

In the case of Chumstick Creek, NMFS views the culvert replacements, and subsequent opening of 75 mi^2 of upstream habitat as a means of re-establishing some habitat diversity to the Wenatchee River watershed, and an opportunity for the re-establishment of locally adapted UCRS chinook and UCR steelhead subpopulations. Overall, the improvement in baseline passage conditions will contribute to the survival and recovery of both species.

B. Effects on Critical Habitat

The NMFS designates critical habitat for a listed species based upon physical and biological features that are essential to that species. Essential features of critical habitat for the UCR steelhead and UCRS chinook include substrate, water quality/quantity, water temperature, water velocity, cover/shelter, food, riparian vegetation, space, and safe passage conditions (65 Fed. Reg.7764, February 16, 2000).

The direct and indirect effects listed previously include some discussion of impacts to critical habitat. Overall, these projects will maintain or improve the functional quality of most habitat indicators. Permanent improvements in baseline habitat conditions will result from the removal of barriers to passage and subsequent increase in habitat diversity (restored physical barrier, LWD, and substrate indicators). The short-term increase in turbidity and loss of potential forage items are not expected to

have a lasting effect on baseline conditions.

In terms of essential habitat features, the primary impact of this action will be a permanent improvement in passage conditions. The NMFS believes that improved passage at the new culverts will open up critical habitat that has been unoccupied since 1957. Accordingly, the newly accessible critical habitat will assist in the survival and recovery of UCR steelhead and UCRS chinook.

C. Cumulative Effects

Cumulative Effects are defined in 50 C.F.R. § 402.02 as "those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation." For this analysis, cumulative effects for the general action area are considered. Future Federal actions, including the ongoing operation of hatcheries, fisheries, and land management activities have been or will be reviewed through separate section 7 consultation processes.

In the Chumstick Watershed there has been some conversion of farms and agricultural lands into residential and commercial developments. Because of the increase in property values, and concurrent increase in property taxes associated with these conversions, it is likely that residential and commercial property development will continue to displace economically unviable farmland in the future (BPA 2000).

The effects of this type of conversion on a watershed are variable, depending on local land use regulations and the physical and biological features of the landscape. However, some watershed effects are predictable. Typically, residential and commercial developments have more impervious surface than farmland. Impervious surface generally alters the stability of the local hydrograph, favoring an increase in the amplitudes of flow events (floods and low flows). Additionally, residential and commercial developments may require increased protection from flood events, which in turn may dislocate Chumstick Creek from its flood plain or channelize the creek.

V. CONCLUSION

The NMFS has determined that the effects of the proposed action will not jeopardize the continued existence of UCR steelhead and UCRS chinook or result in the adverse modification or destruction of their critical habitat. These determinations of no jeopardy are based upon the current status of the species, the environmental baseline for the action area, and the effects of the proposed action.

Overall, the installation of the 24 FWS and BPA culverts will benefit UCRS chinook and UCR steelhead. First, the new culverts will greatly improve habitat accessability and natural habitat forming processes throughout the lower and upper reaches of the Chumstick Creek watershed. Second, this project will contribute to the re-establishment of locally adapted UCRS chinook and UCR steelhead subpopulations.

The culvert replacements will also create short term direct effects with a more than negligible chance of causing incidental take. The most significant risks are posed by the temporary increase in turbidity and the temporary disturbance of the creek-bed that will occur during construction. The risk of incidental take will be minimized by the implementation of conservation measures and BMPs. Overall, the long-term benefits of this project will greatly outweigh the temporary degradation of water quality and disturbance of the creek-bed. At no time, and without contingencies, will the activities described in this BO have levels of take, or destroy habitat, that would appreciably reduce the likelihood of survival and recovery of UCR steelhead and UCRS chinook

VI. REINITIATION OF CONSULTATION

Consultation must be reinitiated if (1) the amount or extent of taking specified in the Incidental Take Statement is exceeded, or is expected to be exceeded; (2) new information reveals effects of the action may affect listed species in a way not previously considered; or (3) a new species is listed or critical habitat is designated that may be affected by the action (50 C.F.R.§ 402.16). The NMFS will be monitoring the listed reasonable and prudent measures and terms and conditions of the incidental take statement. The NMFS may reinitiate consultation if the above measures are not adequately completed, resulting in increased probability of take to listed species. To reinitiate consultation, FWS and/or BPA must contact the Habitat Conservation Division (Washington Branch Office) of NMFS.

VII. INCIDENTAL TAKE STATEMENT

Sections 9 of the ESA prohibits any taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in any such conduct) of listed species without a specific permit or exemption. Section 4(d) enables the extension of this prohibition to animals listed as "Threatened" under the ESA. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as spawning, rearing, feeding, and migrating (50 C.F.R. § 222.106; 64 Fed. Reg. 60727; November 8, 1999). Incidental take is take of listed animal species that results from, but is not the purpose of, the Federal agency or applicant carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to, and is not intended as part of, the agency action is not considered prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement.

An incidental take statement specifies the impact of any incidental taking of endangered or threatened species. It also provides reasonable and prudent measures that are necessary to minimize impacts and set forth terms and conditions with which the action agency must comply in order to implement the reasonable and prudent measures.

A. Amount or Extent of the Take

The NMFS anticipates that incidental take of UCR steelhead and UCRS chinook could result from project activities as described in the BO. Despite the use of the best scientific and commercial data available, NMFS cannot estimate a specific amount of incidental take of individual fish or incubating eggs. However, the mechanisms of expected effects are explained below.

The NMFS believes that there are several mechanisms by which take could occur. Direct harm or injury may result from in-water construction (turbidity), and the temporary disturbance of the creek-bed (lack of forage items). The extent to which these mechanisms can result in effects on listed steelhead and chinook, or their habitat, can be described qualitatively, enabling reinitiation of consultation if such effects are exceeded during the project: (1) turbidity increases will not extend further than two miles downstream of the construction site, and (2) the creek-bed disturbance will not continue past the work window set forth in the HPA (i.e., in-water work will be completed on time). The NMFS does not expect any additional take through indirect impacts of the proposed activities.

B. Reasonable and Prudent Measures

The NMFS believes that the following reasonable and prudent measures (RPMs) are necessary and appropriate to minimizing take of UCRS chinook and UCR steelhead. These RPMs are integrated into the BA and proposed project, and NMFS has included them here to provide further detail as to their implementation.

1. The applicants will minimize take by incorporating BMPs to reduce potential impacts of staging and onshore construction activities.

2. The applicants will minimize take by incorporating BMPs to reduce potential impacts of instream construction activities

3. The applicants will minimize take by incorporating appropriate timing restrictions.

C. Terms and Conditions

To be exempt from the prohibitions of section 9 of the ESA, FWS and BPA must comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are non-discretionary and apply to both action agencies.

1. Implement RPM #1 by conducting the following

    a. A temporary erosion and sediment control (TESC) plan will be implemented.
    b. A spill prevention, control, and containment (SPCC) plan will be implemented.
    c. Hydraulic fluid in heavy equipment will be replaced with mineral oil or other biodegradable, non-toxic hydraulic fluid.
    d. All heavy equipment will be clean and free of external oil, fuel, or other potential pollutants.
    e. Disturbed riparian areas will be replanted.
    f. All planting will use native species appropriate for riparian use.

2. Implement RPM #2 by conducting the following

    a. Heavy equipment will work from on-shore (or constructed) staging areas, with the exception of an excavator arm or bucket.
    b. Placement of rocks or culvert components will be done by a qualified heavy equipment operator.
    c. Any fill material entering Chumstick Creek will be clean and free of fines.

3. Implement RPM #3 by conducting the following

a. Construction will take place in the period set forth by the WDFW HPA.

VIII. CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop additional information.

The NMFS would encourage BPA to replace the North Road culvert with a bridge rather than a new culvert. Although the proposed new culvert will greatly improve fish passage, NMFS believes that a bridge would allow for more normal hydrogeomorphic processes to occur and provide improved connectivity between Chumstick Creek and adjacent riparian, hyporheic and flood plain habitats. The improved function and connectivity would enhance baseline habitat conditions for listed UCRS chinook and UCR steelhead.

The NMFS must be kept informed of actions minimizing or avoiding adverse effects, or those that benefit listed species or their habitat. Accordingly, NMFS requests notification of the implementation of any conservation recommendations.

IX. ESSENTIAL FISH HABITAT

Public Law 104-267, the Sustainable Fisheries Act of 1996, amended the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) to establish new requirements for "Essential Fish Habitat" (EFH) descriptions in Federal fishery management plans and to require Federal agencies to consult with NMFS on activities that may adversely affect EFH. EFH "means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (Magnuson-Stevens Act §3). This definition includes those waters and substrate necessary to ensure the production needed to support a long-term sustainable fishery (*i.e.*, properly functioning habitat conditions necessary for the long-term survival of the species through the full range of environmental variation).

Section 305(b) of the Magnuson-Stevens Act (16 U.S.C. 1855(b)) requires that:

- Federal agencies must consult with NMFS on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH;
- NMFS shall provide conservation recommendations for any Federal or State activity that may adversely affect EFH;

- Federal agencies shall, within 30 days after receiving conservation recommendations from

> NMFS, provide a detailed response in writing to NMFS regarding the conservation recommendations. The response shall include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with the conservation recommendations of NMFS, the Federal agency shall explain its reasons for not following the recommendations.

The Magnuson-Stevens Act does not distinguish between actions in EFH and actions outside of EFH, such as upstream and upslope activities that may have an adverse effect on EFH. Therefore, EFH consultation with NMFS is required by Federal agencies undertaking, permitting, or funding an activity that may adversely affect EFH, regardless of its location.

The Pacific Fisheries Management Council (PFMC) has designated EFH for three species of Pacific salmon: chinook (*Oncorhynchus tshawytscha*); coho (*O. kisutch*); and Puget Sound pink salmon (*O. gorbuscha*)(PFMC 1999). Freshwater EFH for Pacific salmon includes all those streams, lakes, ponds, wetlands, and other water bodies currently, or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable man-made (as identified by the PFMC) and longstanding, naturally-impassable barriers (i.e., natural waterfalls in existence for several hundred years).

A. Effects of Proposed Action

The proposed actions are described in the Background and Description of the Proposed Project section of this BO. The projects occur within the area designated as EFH for various life stages of chinook salmon. Detailed descriptions and identifications of EFH for salmon are found in Appendix A to Amendment 14 to the Pacific Coast Salmon Plan (PFMC 1999). Assessment of the impacts of the proposed actions to designated EFH is based on this information.

The proposed culvert replacements may result in adverse short-term impacts on the designated EFH for chinook salmon. Potential adverse impacts are detailed above in the Analysis of Effects Section of this BO, and include: 1) temporary increases in turbidity; 2) disturbance of the creek-bed; and 3) alteration of channel morphology. However, the BAs and the Terms and Conditions section of this BO contain non-discretionary conservation measures, including, but not limited to: 1) implementation of a temporary erosion and sediment control plan; 2) replanting of disturbed riparian vegetation with native species; and 3) performing work during appropriate timing windows. Because of these measures, NMFS believes that the effects of the proposed actions are transient, local, and of low intensity and are not likely to adversely affect EFH in the long-term. NMFS also believes that the conservation measures proposed as part of the actions would avert, minimize, or otherwise offset potential adverse impacts to designated EFH.

B. EFH Conservation Recommendations

The conservation measures described in the BAs and the Terms and Conditions section of this BO are applicable to designated EFH for chinook salmon. It is NMFS' understanding that the FWS and BPA

intend to implement the proposed activities with these built-in conservation measures that avoid, minimize, or otherwise offset adverse effects to the maximum extent practicable. Therefore, NMFS has no conservation recommendations to make at this time.

C. Statutory Requirements

Please note that the Magnuson-Stevens Act (16 U.S.C. 1855(b)) requires the Federal agency to provide a written response to NMFS' EFH conservation recommendations within 30 days of its receipt of this letter. However, since there are no conservation recommendations, no further action is needed to fulfill the EFH consultation provisions.

D. Consultation Renewal

The FWS and BPA must reinitiate EFH consultation with NMFS if their proposed actions are substantially revised in a manner that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH conservation recommendations (50 CFR Part 600.920).

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